(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 550 416 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
06.07.2005 Bulletin 2005/27

(51) Int Cl.[7]: **A61B 17/15**, A61B 5/107

(21) Application number: **04258129.8**

(22) Date of filing: **24.12.2004**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU MC NL PL PT RO SE SI SK TR
Designated Extension States:
AL BA HR LV MK YU

(30) Priority: **30.12.2003 US 748449**

(71) Applicant: **DePuy Products, Inc.**
Warsaw, IN 46581 (US)

(72) Inventors:
- **German, Deb**
Plymouth, IN 46563 (US)
- **Truman, Mari**
Warsaw, IN 46580 (US)
- **Keeven, Rick**
Warsaw, IN 46580 (US)

(74) Representative: **Belcher, Simon James**
Urquhart-Dykes & Lord LLP
Tower North Central
Merrion Way
Leeds LS2 8PA (GB)

(54) Instrument augments for filling a bone joint gap

(57) A system for establishing a prosthetic gap between first and second bones at a joint includes an instrument (50,80) for positioning within the gap between the first and second bones, and an augment (70) for filling the gap when coupled to the instrument. In one embodiment, a resilient coupling member (68) is provided to couple the augment to the instrument resiliently and removably. In another embodiment, the instrument and augment are configured so that the augment can be coupled to the instrument on either one of opposite surfaces of the augment facing the first and second bones.

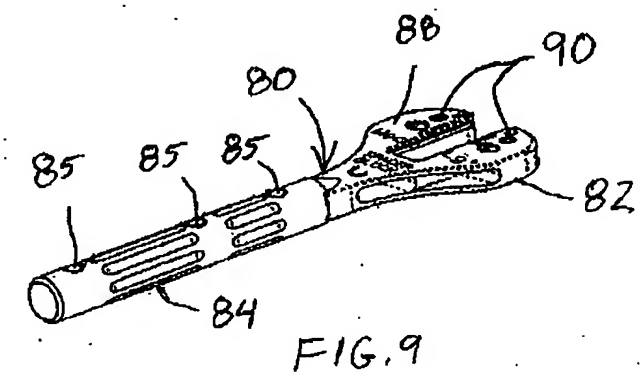

FIG. 9

EP 1 550 416 A1

Description

[0001] The present invention relates to devices for use in orthopaedic surgery, and especially for proper alignment of surgical instruments used in preparing a bone for an implant. The invention has particular application in preparing the distal end of the femur to receive a femoral prosthesis.

[0002] Damage or disease can deteriorate the bones, articular cartilage and ligaments of human joints, such as the knee, which can ultimately affect the ability of the natural joint to function properly. To address these conditions, prosthetic joints have been developed that are mounted to prepared ends of the bones of the joint, namely the tibia and femur in the case of a knee prosthesis. Among the many knee prostheses, a mobile bearing knee simulates the condylar and bearing surfaces of the knee to emulate the natural movement of the knee during flexion and extension. The tibial component is configured to permit rotation about the axis of the tibia to accurately replicate the effects of differential rollback in the transverse plane.

[0003] Implantable mobile bearing knee prostheses, such as the prosthesis 10 shown in FIG. 1, for diseased and/or damaged knees typically include three components, namely a tibial component 12, a femoral component 16 and a meniscal component (not shown). The tibial component 12 includes a platform 13 with a stem 14 configured for engagement in the prepared proximal end of the tibia. Generally, in a total knee joint replacement the platform 13 replaces the entire superior surface of the tibial plateau and substitutes for the tibial condylar surfaces. The femoral component can also include laterally-spaced condylar portions joined by an inter-condylar bridge and a patellar surface.

[0004] The femoral component 16 defines interior mounting surfaces 17 that often require involved cuts into the distal end of the femur. Since the components of the mobile bearing knee prosthesis 10 are generally configured to restore or emulate as much of the natural motion of the knee joint as possible, the femoral component often has a complicated geometry, which requires significant modification to the femur to accept and support the implant. The selection of the particular prosthesis components is usually dictated by the condition of the patient's knee. For instance, the condition of the distal end of the femur and proximal end of the tibia, as well as the patency of the surrounding ligaments and soft tissue can affect the form of the joint prosthesis.

[0005] In addition to the overall implant geometry, implant positioning with respect to the natural bone is critical. For instance, a proper implant will maintain the proper tension in the retained ligaments supporting the joint. In total knee reconstruction surgery, the menisci, bone ends and other stabilizing tissues are removed and replaced with implants. The thicknesses of the implants are ideally equal to the thickness of the removed material. Exceptions occur in reconstruction of severe deformity, where ligament length and tension after tissue releases during the reconstruction vary significantly form the preoperative state and from the normal knee.

[0006] Intraoperatively, the gap between the facing ends of the bones of the joint, which are related to the final implant position, can be manipulated. In the knee, a critical measure is the gap when the knee is in flexion or extension. The bone gaps in an ideal surgical reconstruction will have be the same in flexion and extension, the only exception being with implant systems having uneven implant thicknesses between anterior and posterior, or between medial and lateral compartments on either the tibial or femoral implants. The bone gaps for implants with unequal thicknesses must be accommodated for by the measuring tool or in the measurements when accessing potential implant fit. An ideal implant will maintain the same tension in flexion and extension, and the resulting joint tension and the stability of the implant will be substantially identical to the joint tension and stability of the patient's natural knee.

[0007] In preparing a knee joint, for instance, to receive a prosthesis, the orthopaedic surgeon typically uses templates to determine the proper size of the implant components. The surgeon may also measure the joint gap and choose a spacer that can be used in the procedure to maintain that gap. Since the femoral component of the knee prosthesis requires complex cuts in the femur, a femoral resection guide is used, such as the resection guide 20 shown in FIG. 2. The main body 22 of the guide 20 is aligned at the distal end of the femur F and held in place by one or more guide pins 24. The resection guide 20 may include other structure and components for maintaining the guide in a proper orientation as the femur is resected.

[0008] In order to ensure that the resulting femoral implant achieves the proper flexion and extension gaps, a femoral positioner 26 is often used. The femoral positioner shown in FIG. 2 includes a surface alignment plate 28 that rests on the previously resected surface R of the tibia. The alignment plate 28 is integral with a connector plate 30 that fits within a slot 23 in the main body 22 of the resection guide 20. The femoral positioner 26 is thus used to help position the resection guide so that the femur is properly resected.

[0009] Another known femoral resection guide 32 is depicted in FIG. 3. This guide includes a body 33 defining a slot 34 for receiving a saw. A stylus 36 is used to align the depth of the saw cut. Handles 40 can be provided to help stabilize the resection guide during a cut. Guide pins 38 extend into the femur F to align and support the resection guide.

[0010] It is important that the resection guide be properly oriented when the distal end of the femur is prepared, otherwise the femoral implant will be produce undue strain or laxity in the knee joint. It is critical to maintain equal flexion and extension gaps to restore the proper anatomic tension as much as possible, regardless of the nature of the knee prosthesis. For instance,

most mobile bearing knees are modular, meaning that several bearing elements can be provided depending upon the patient's anatomy. Obviously, thicker bearing elements correspond to greater flexion/extension gaps.

[0011] Similar modularity is important in the guide instruments used to ensure proper manipulation of the bones of the joint. There is a need, therefor, for an augment that can be readily used in the orthopaedic procedure to allow the guide instruments to properly emulate the natural anatomy of the instrumented joint.

[0012] Moreover, there is a need for an augment that can account for variations in the quality of the underlying bone. This need is particularly acute for revision surgeries in which the bone may have defects that make finding a stable platform difficult.

[0013] In one aspect of the invention a system is provided for establishing a prosthetic gap between first and second bones at a joint. The system comprises an instrument for positioning within the gap between the first and second bones, the instrument having a first surface facing the first bone and a second surface facing the second bone. The system further comprises an augment for filling the gap when coupled to the instrument.

[0014] The augment and instrument include a mating connection mechanism that permits ready mounting and removal of the augment to the instrument. In certain embodiments, the instrument defines at least one bore between the first and second surfaces and the augment includes at least one pin sized to be received within the at least one bore with the augment in contact with either the first surface or the second surface. Other mating connection mechanisms can include other male-female constructs, such as dovetail or snap-fit mechanisms, or a canted coil spring mechanism.

[0015] In one specific embodiment, the instrument is a femoral positioner that includes a surface alignment plate configured to engage the tibia and a connector plate configured to engage a femoral resection guide. The surface alignment plate defines the at least one bore and is contacted by a mating surface of the augment form which the pin projects. In another specific embodiment, the instrument is a spacer block having a spacer body and a handle projecting therefrom. The spacer block defines the at least one bore.

[0016] In one aspect of the invention, the bore includes a resilient member disposed therein. The resilient member is configured to resiliently engage the pin when the pin extends through the bore. In one embodiment, the bore defines an internal groove, and the resilient member is an O-ring mounted within the groove. In an alternative embodiment, the bore defines a pair of internal grooves, one each adjacent each of the first and second surfaces, and the resilient member includes an O-ring mounted within each of the pair of grooves.

[0017] The augment includes a mating surface for contacting the instrument when the pin is within the bore, and an opposite surface. In certain embodiments, the opposite surface is substantially parallel to the first or second surface of the instrument. In other embodiments, the opposite surface defines a contour substantially similar to the contour of the first or second bones.

[0018] In another aspect of the invention, a system for establishing a prosthetic gap between first and second bones at a joint comprises an instrument for positioning within the gap between the first and second bones, an augment for filling the gap when coupled to the instrument, and means for removably coupling the augment to the instrument including a resilient member disposed between the augment and the instrument. In one embodiment, the means for removably coupling includes a bore defined in the instrument and a pin disposed on the augment sized for engagement within the bore, with the resilient member disposed within the bore. The resilient member can be one or more O-rings disposed within the bore.

[0019] The illustrated embodiment is used for a knee prosthesis. However, it is contemplated that the present invention can be used in other human joints that may benefit from the features of the present invention.

[0020] It is one object of the invention to provide an augment that can serve as a spacer or a shim as part of a system for establishing a prosthetic gap for a human joint. Another object is to provide an augment that can be readily and securely mounted and disengaged from an instrument used in the system for establishing a prosthetic gap.

[0021] Embodiments of the invention will now be described by way of example with reference to the accompanying drawings, in which:

FIG. 1 is a perspective view of one type of knee prosthesis.

FIG. 2 is a side representation of a femoral resection guide as it is being positioned on the femur.

FIG. 3 is a perspective view of another known femoral resection guide.

FIG. 4 is a perspective view of a femoral positioner according to one embodiment of the invention.

FIG. 5 is a top elevational view of the femoral positioner shown in FIG. 4.

FIG. 6 is an enlarged cross-sectional view of a portion A in FIG. 5.

FIG. 7 is a top elevational view of an augment in accordance with one embodiment of the invention.

FIG. 8 is a side elevational view of the augment shown in FIG. 7.

FIG. 9 is a perspective view of a spacer block in accordance with a further embodiment of the invention.

FIG. 10 is a top elevational view of the spacer block shown in FIG. 9.

FIG. 11 is a side elevational view of the spacer block illustrated in FIG. 9

FIG. 12 is a cross-sectional view of the spacer block depicted in FIGS. 9 and 10 taken along line B-B.

[0022] Referring to the drawings, which show a femoral positioner 50 that can be used with a femoral resection guide, such as the guides 20 and 32 depicted in FIGS. 2 and 3. The positioner 50 includes a surface alignment plate 52 that is configured to rest on the resected surface R of the tibia, like the positioner 26 shown in FIG. 2. The alignment plate 52 defines a slot 54 that can engage a pin disposed within the medullary canal of the tibia (not shown) to align the plate with the resected tibial plateau in a known manner.

[0023] A connector plate 56 is arranged parallel with the surface alignment plate 52 and is configured to engage a mating feature in the resection guide. For instance, the connector plate 56 can engage the slot 23 in the main body of the resection guide 20 shown in FIG. 2, or the slot 34 or other mating feature in the guide 32. A base 58 integrally spans between the plates 52, 56 and establishes the distance between these two parallel plates. The base thus sets the distance between the surface of the tibia and a reference point by which the position of the resection guide is established. The base 58 can define a bore 60 to receive an alignment rod (not shown) that can be used to check ligament tension during the instrumentation procedure.

[0024] The femoral positioner 50 is used to position the femur relative to the resected end R of the tibia. When the femur is properly positioned, the resection guide can be mounted on the exposed end of the femur and the necessary cuts made at the proper location on the bone. While the positioner 50 may be properly sized to achieve these results for some patients, the majority of the cases will require some augmentation for the surface alignment plate. In some cases, the necessary augmentation is simply to close the space between the alignment plate 52 and the posterior surface of the femur when the knee is flexed, as shown in FIG. 2. In other cases, the surface of either the femur or the tibia has surface defects that compromise the stable support of the femoral positioner 50.

[0025] In either case, an augment, such as the augment 70 shown in FIGS. 7 and 8 may be necessary. The augment 70 includes a mating surface 72 and an opposite surface 75. The mating surface 72 contacts the surface alignment plate 52 of the positioner 50, while the opposite surface 75 contacts the bone. In the most basic case, the opposite surface 75 is flat and parallel to the mating surface 72. The thickness between these two surfaces can vary as necessary to fill the expected flexion/extension gap. Nominally, several augments 70 can be provided, each having different thicknesses. Where the augment 70 serves as a shim or spacer, the augment will normally be supported on the femoral-facing surface 62a of the positioner 50 (FIG. 6).

[0026] In other cases, the surface 75 of the augment 70 can include contours, such as the contours 76 shown in dashed lines. These contours are configured to match defects in the bone against which the augment bears. Where the defects are in the tibia, the augment will be mounted to the underside or the tibia-facing surface 62b of the positioner 50 (FIG. 6). The contours 76 fill the bone defects and ensure that the mating surface 72 will be supported in a proper parallel orientation.

[0027] In order to facilitate mounting and removal of the augment 70 from the positioner 50, means for removably coupling the components together are provided that incorporate a resilient member. In the preferred embodiment, the surface alignment plate 52 is provided with a pair of bores 64 on opposite sides of the notch 54. The augment 70 includes a mating pair of pins 74 that are sized to be received within a corresponding one of the bores. As shown in the detail of FIG. 6, each of the bores defines an internal groove 66 configured to receive an elastomeric O-ring 68. Each pin 74 is sized to pass through the bore 64 into frictional contact with the O-ring 68. The O-ring provides a tight elastomeric fit so that the pins are not easily dislodged from the bores during normal manipulation of the femoral positioner 50. Each pin can be provided with a groove (not shown) to receive the O-ring when the pin is properly positioned within the bore.

[0028] In the preferred embodiment, the O-ring groove 66 is offset toward the tibial surface 62b. The bore 64 has a diameter on either side of the groove 66 that provides a close running fit for the pin 74. The O-ring defines an inner diameter that is less than the diameter of the bore. Thus, the tip 74a of the pin can be tapered to facilitate being pushed through the O-ring 66. The base of the bore 64 at the tibial side can be provided with a chamfer 65 to further facilitate placement of the pin into the bore from the underside of the femoral positioner 50.

[0029] The augment 70 can also be used with a spacer block, such as the spacer block 80 shown in FIGS. 9-12. The spacer block 88 includes a spacer body 82 connected to a handle 84. The block defines a notch 83 therein that serves the same function as the notch 54 in the femoral positioner 50 discussed above. The handle 84 defines a number of angled bores 85 configured for receiving an alignment rod (not shown). The spacer block 80 can be used in a conventional manner to verify the flexion and extension gaps when the resection guide is mounted to the femur, or after the femoral implant has been mounted on the finished distal end of the femur.

[0030] In order to accommodate a variety of joint anatomies, the body 82 of the spacer block defines a pair of bores 90 passing from the tibial surface 87 to the femoral surface 88. The bores are sized to receive the pins 74 of an appropriate augment 70. In accordance with the invention, the bores are provided with O-ring grooves and O-rings to firmly hold the pins within the bores.

[0031] In one feature of the embodiment, the bores 90 are provided with two grooves 92a, 92b and two O-rings 94a, 94b. One O-ring 94a is positioned near the femoral surface 88 and the other O-ring 94b is positioned near the tibial surface 87. It is contemplated that the pins 74 of the augment 70 have a predetermined

height from the mating surface 72 that is calibrated to fit the bores 64 in the femoral positioner 50. Since the surface alignment plate 52 of the positioner is thinner than the body 82 of the spacer block 80, the height of the pins 74 is less than the thickness of the spacer block. Consequently, in order to orient an O-ring in a location where they can fully engage the pins, two O-rings 94a, 94b are provided, with a corresponding one offset to each surface of the spacer block.

[0032] In an alternative feature, the bore 90 can define a larger bore portion 90a and a smaller bore portion 90b. The larger portion 90a is adjacent the femoral surface 88, while the smaller portion 90b opens at the tibial surface 87.

[0033] While the described embodiment uses O-rings to provide the temporary fixation of the augment, the O-rings can be replaced with other resiliently gripping components. For instance, a slitted membrane can span the bores 64 or 90, wherein the pin penetrates the membrane, which then resiliently grasps the surface of the pin. Similarly, the O-rings can be replaced with a canted coil spring, similar to the canted spring coupling ring marketed by Bal-Seal Engineering. In this case, the engagement pins can define a groove to engage the canted coil spring.

Claims

1. A system for establishing a prosthetic gap between first and second bones at a joint comprising:

   an instrument for positioning within the gap between the first and second bones, said instrument having a first surface facing the first bone and a second surface facing the second bone, and defining at least one bore between said first and second surfaces; and
   an augment for filling the gap when coupled to said instrument, said augment including at least one pin sized to be received within said at least one bore with said augment in contact with either said first surface or said second surface.

2. The system for establishing a prosthetic gap of claim 1, wherein said instrument is a femoral positioner that includes a surface alignment plate configured to engage the tibia and a connector plate configured to engage a femoral resection guide, said surface alignment plate defining said at least one bore.

3. The system for establishing a prosthetic gap of claim 1, wherein said instrument is a spacer block having a spacer body and a handle projecting therefrom, said spacer block defining said at least one bore.

4. The system for establishing a prosthetic gap of claim 1, wherein said bore includes a resilient member disposed therein, said resilient member configured to resiliently engage said pin when said pin extends through said bore.

5. The system for establishing a prosthetic gap of claim 4, wherein said bore defines an internal groove, and said resilient member is an O-ring mounted within said groove.

6. The system for establishing a prosthetic gap of claim 5, wherein:

   said bore defines a pair of internal grooves, one each adjacent each of said first and second surfaces; and
   further wherein said resilient member includes an O-ring mounted within each of said pair of grooves.

7. The system for establishing a prosthetic gap of claim 1, wherein said augment includes a mating surface for contacting said instrument when said pin is within said bore, and an opposite surface that is substantially parallel to said first or second surface of said instrument.

8. The system for establishing a prosthetic gap of claim 1, wherein said augment includes a mating surface for contacting said instrument when said pin is within said bore, and an opposite surface for contacting one of the first or second bones when said mating surface contacts said instrument, said opposite surface defining a contour substantially similar to the contour of the first or second bones.

9. A system for establishing a prosthetic gap between first and second bones at a joint comprising:

   an instrument for positioning within the gap between the first and second bones;
   an augment for filling the gap when coupled to said instrument; and
   means for removably coupling said augment to said instrument including a resilient member disposed between said augment and said instrument.

10. A system for establishing a prosthetic gap between first and second bones at a joint comprising:

    an instrument for positioning within the gap between the first and second bones, said instrument having a first surface facing the first bone and a second surface facing the second bone;
    an augment for filling the gap when coupled to said instrument; and

means for engaging the augment to the instrument adjacent either said first surface or said second surface.

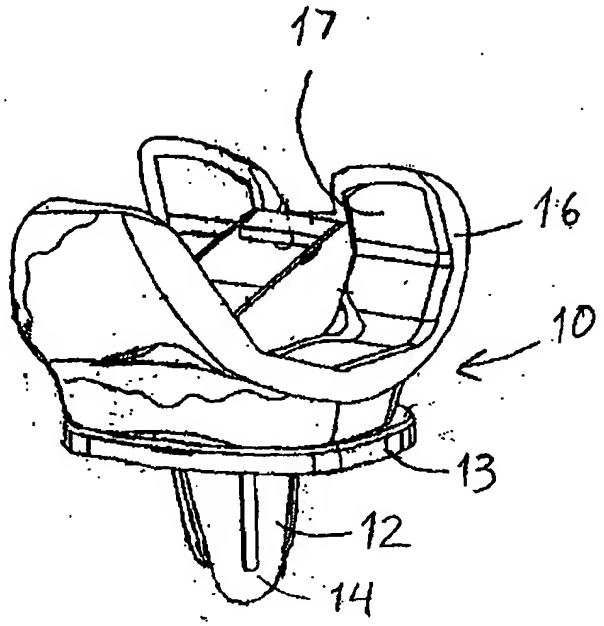

Fig. 1
(PRIOR ART)

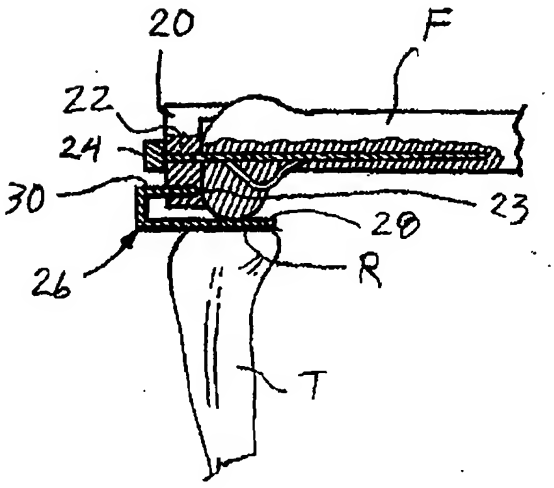

Fig. 2
(PRIOR ART)

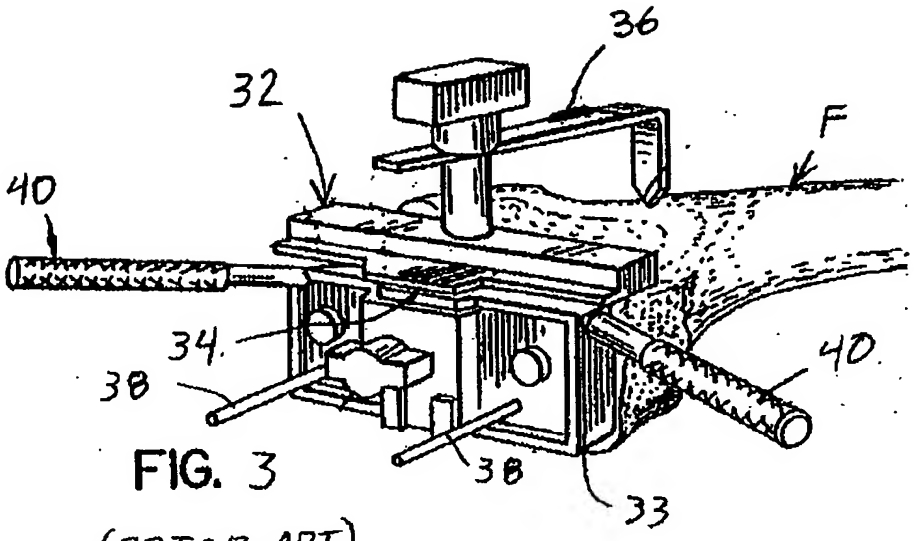

FIG. 3

(PRIOR ART)

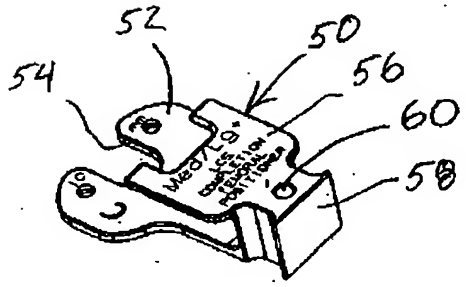

FIG. 4

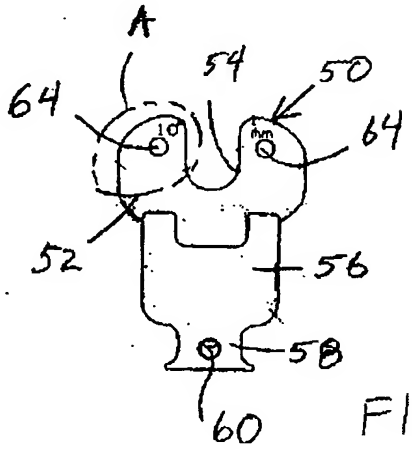

FIG. 5

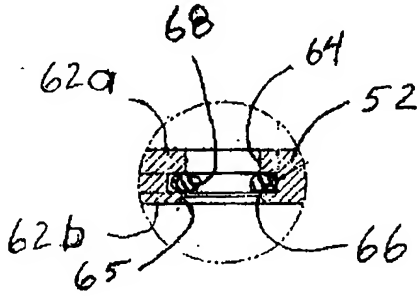

FIG. 6

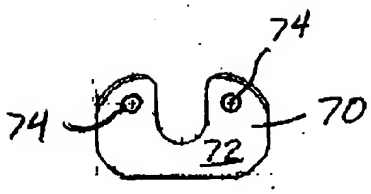

FIG. 7

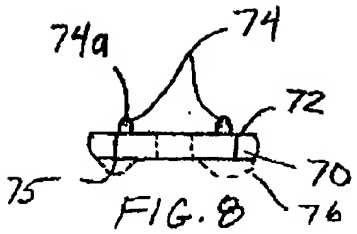

FIG. 8

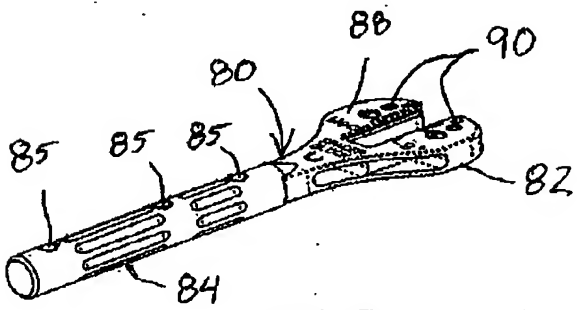

FIG. 9

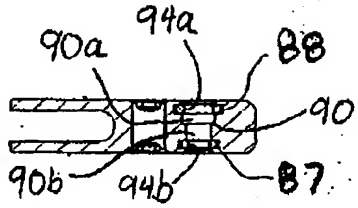

FIG. 12

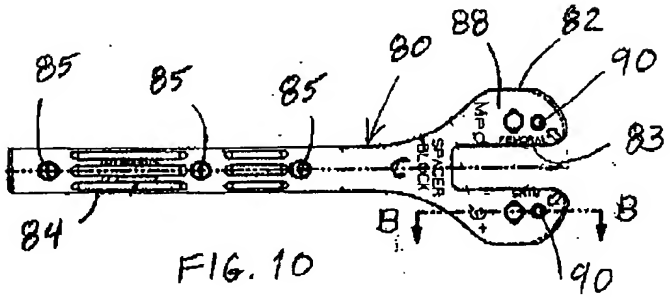

FIG. 10

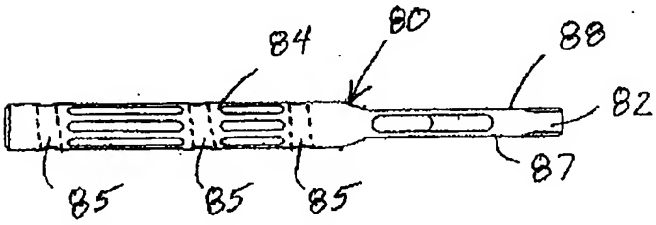

FIG. 11

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 04 25 8129

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	EP 0 919 195 A (SULZER ORTHOPÄDIE) 2 June 1999 (1999-06-02) * paragraphs [0011] - [0015]; figures 1-4,7 *	1,2,4-10	A61B17/15 A61B5/107
X	US 6 458 135 B1 (HARWIN S.F. ET AL) 1 October 2002 (2002-10-01) * column 5, line 4 - line 16 * * column 7, line 66 - column 8, line 9 * * figures 4,5 *	1-10	
X	US 5 649 929 A (CALLAWAY G.H.) 22 July 1997 (1997-07-22) * column 5, line 9 - line 13 * * column 5, line 32 - line 37 * * column 6, line 40 - line 42 * * figures 7-9 *	1-10	
X	WO 98/25526 A (MULO) 18 June 1998 (1998-06-18) * page 7, line 19 - page 8, line 1 * * page 8, line 19 - line 28 * * page 11, line 4 - line 11 * * figures 3,4,10,11 *	10	TECHNICAL FIELDS SEARCHED (Int.Cl.7) A61B
X	US 5 520 695 A (LUCKMAN T.) 28 May 1996 (1996-05-28) * column 4, line 53 - line 61; figures 4-6 *	10	
X	US 6 056 754 A (HAYNES T.G. AND GOLDSTEIN D.B.) 2 May 2000 (2000-05-02) * column 14, line 40 - line 45; figure 14 *	10	

-/--

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	5 April 2005	Nice, P

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 04 25 8129

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	US 6 575 980 B1 (ROBIE B. ET AL.) 10 June 2003 (2003-06-10) * column 4, line 23 - line 32 * * claims 10,11; figure 10 *	10	
A	WO 97/21389 A (WRIGHT MEDICAL TECHNOLOGY) 19 June 1997 (1997-06-19) * page 13, line 1 - line 29; figure 14 *	1,4-6,9	
A	US 4 738 254 A (BUECHEL F.F. AND PAPPAS M.J.) 19 April 1988 (1988-04-19)		
A	WO 99/09900 A (DEPUY ORTHOPAEDICS) 4 March 1999 (1999-03-04)		
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	5 April 2005	Nice, P

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 04 25 8129

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

05-04-2005

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0919195 A	02-06-1999	EP 0919195 A1	02-06-1999
		JP 11221244 A	17-08-1999
		US 6096082 A	01-08-2000
US 6458135 B1	01-10-2002	NONE	
US 5649929 A	22-07-1997	NONE	
WO 9825526 A	18-06-1998	BE 1010738 A5	01-12-1998
		AT 262836 T	15-04-2004
		AU 746310 B2	18-04-2002
		AU 5560698 A	03-07-1998
		CA 2274935 A1	18-06-1998
		DE 69728430 D1	06-05-2004
		DE 69728430 T2	03-03-2005
		WO 9825526 A1	18-06-1998
		EP 0959780 A1	01-12-1999
		JP 2001505456 T	24-04-2001
		NO 992813 A	14-07-1999
US 5520695 A	28-05-1996	NONE	
US 6056754 A	02-05-2000	US 5810827 A	22-09-1998
		US 5514139 A	07-05-1996
		US 5597379 A	28-01-1997
		US 5643272 A	01-07-1997
		AU 1961597 A	02-09-1997
		AU 2125797 A	02-09-1997
		EP 0888089 A1	07-01-1999
		WO 9729703 A1	21-08-1997
		WO 9729704 A1	21-08-1997
		US 6197064 B1	06-03-2001
		US 5755803 A	26-05-1998
		US 2005055028 A1	10-03-2005
		US 2002029038 A1	07-03-2002
		US 5879354 A	09-03-1999
		AU 686457 B2	05-02-1998
		AU 3543295 A	27-03-1996
		CA 2198915 A1	14-03-1996
		EP 0778751 A1	18-06-1997
		JP 10507107 T	14-07-1998
		WO 9607361 A1	14-03-1996
US 6575980 B1	10-06-2003	AU 737097 B2	09-08-2001
		AU 6253798 A	18-08-1998
		CA 2278780 A1	30-07-1998

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 04 25 8129

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

05-04-2005

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6575980 B1		EP 0971638 A1	19-01-2000
		JP 2001509053 T	10-07-2001
		WO 9832384 A1	30-07-1998
WO 9721389 A	19-06-1997	WO 9721389 A1	19-06-1997
US 4738254 A	19-04-1988	NONE	
WO 9909900 A	04-03-1999	US 5938665 A	17-08-1999
		WO 9909900 A1	04-03-1999

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82